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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1065.

For the Week Ending May 30, 1896.

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OUR PRIZE ESSAY COMPETITION.

We take much pleasure in announcing that Judge A. P. Greeley, of the Patent Office, Washington, Prof. R. H. Thurston, of Cornell University, and Prof. R. S. Woodward, of Columbia University, have consented to act as judges in our forthcoming prize essay competition. Their names are so well and honorably known in the world of science and art as to need no introduction to our readers, and intending competitors will feel that the wide experience and ripe attainments of these gentlemen are a guarantee that their interests will be in safe and discriminating hands.

Prof. R. S. Woodward, who is the Dean of the School of Pure Science and Professor of Mechanics, Columbia University, was for many years engaged in the Geological and Lake Surveys of the United States Government, during which time he formed one of the Transit of Venus Commission. His voluminous contributions to scientific and technical literature during the past twenty years cover a wide range of subjects, and have won for him a high reputation among the scientific societies of both hemispheres.

Prof. R. H. Thurston, Director of Sibley College and Professor of Mechanical Engineering, Cornell University, was for many years Professor of Engineering at the Stevens Institute of Technology. He is a past president of the American Society of Mechanical Engineers, and his name appears upon the roll of many other engineering societies in Europe and America. Perhaps he is best known by his many works upon engineering and kindred subjects, which form a valuable part of the technical literature of this country. Judge Arthur P. Greeley, Examiner in Chief at the Patent Office, Washington, who is a lawyer by profession, has won his present high position in various competitive examinations, in which he has gained successively the position of third, second, first assistant and principal examiner. His long and varied experience in the Patent Office has given him at once a broad and detailed acquaintance with the development of the various arts in the past half century.

With the selection of a jury, the arrangements for the competition are now complete, and we trust that intending competitors will facilitate the work of these gentlemen by forwarding their manuscripts at the earliest convenient date.

THE INVENTION OF THE BESSEMER PROCESS.

Some further correspondence relating to the invention of the Bessemer process has lately appeared in the technical press, and as it comes from the pen of Mr. Bessemer himself and of one of the contemporaries and co-workers of Mr. Kelly, it is of special interest. By reference to the presidential address of Mr. Joseph D. Weeks before the American Institute of Mining Engineers, published in the SUPPLEMENT of April 25, it will be seen that among other witnesses quoted therein as testifying to having seen Mr. Kelly's experiments is Mr. John E. Fry, who was at the time a foundry moulder at the Cambria Works. Mr. Fry's testimony, as quoted by Mr. Weeks, gives some details of the apparatus used by Mr. Kelly, and describes the experiments up to the point at which "the pipe was shoved down with the blast on," and "a cover of pieces of sheet iron was laid across the top to prevent the sparks flying too freely." In his reply to the address, Mr. Bessemer complained that Mr. Fry's testimony stopped short at the very point where it became most interesting, and he claimed that the testimony of the witnesses "would have been infinitely more to the purpose if they had told us something about the way in which this metal was taken out, in what state of partial or complete solidity it was obtained," etc., and he drew the conclusion that "the absence of these facts affords very strong circumstantial evidence that Kelly never had produced homogeneous malleable iron, and had never made an ingot by his process."

The publication of the address, and Mr. Bessemer's reply, caused Mr. John E. Fry to write an explanatory letter to Mr. Bessemer, which has been widely published in the English technical press. The letter, with Mr. Bessemer's comments upon it, will be found in the current issue of the SUPPLEMENT.

Mr. Fry, who is now the manager of the Cambria Steel Works, states in this letter that the evidence which was quoted in the presidential address was extracted from some "personal recollections" which he furnished to Mr. Weeks in the course of a two hours' conversation on the subject of the early Kelly experiments, a conversation which took place at Mr. Weeks' request. In connection with this interview, he furnished Mr. Weeks with a drawing of Mr. Kelly's apparatus made in 1858, and also with a copy of an article which he had written in 1894, entitled "The Bessemer Industry: Johnstown's Contribution to it." He goes on to say: "My interview with Mr. Weeks gave him vivid personal recollections antagonistic to his views. The drawing proved that, as late as the year 1858, Mr. Kelly's experiments and ideas had not progressed beyond the operation of the 'finery fire,' and the printed article gave what I believe to be the very first public announcement of Mr. Kelly's absolute failure to accomplish anything that would give ground to his claim of being the inventor of the pneumatic process of converting cast iron into its malleable products." He further says of the Johnstown publication above referred to, "In it I made as plain as circumstances would warrant that Mr. Kelly was copying your methods as fully as his limited sources of information enabled him to do, and that he was doing only that."

The publication of this very timely letter can have but one effect as far as the evidence in favor of Mr. Kelly's claims is concerned. It shows that whatever other testimony may be adduced in his favor, the evidence of the man who was told off by the Cambria authorities to assist Mr. Kelly is emphatically against him. It is scarcely necessary to add that Mr. Fry has completely cleared himself of any suspicion of giving a distorted or partial statement of the facts as far as he knew them.

It is to be hoped that, with the publication of Mr. Fry's letter, the public has heard the last of this long-buried question. It is the great value of the testimony of Mr. Fry that has led us to bring it again before our readers, coupled with the conviction that the full testimony will serve to settle any doubts which may have been aroused as to the historical facts connected with one of the greatest inventions of the century.

MOLECULAR ANNEALING.

Thanks to the investigations of Mr. Alexander E. Outerbridge, Jr., the ghost of the old theory of the crystallization of cast iron under the influence of repeated shocks is "laid" forever. According to this gentleman, not only is cast iron not weakened by repeated blows, but it is actually and considerably strengthened thereby. Mr. Outerbridge, who is now chemist to the William Sellers Company, of Philadelphia, noticed some years ago, when he was engaged in metallurgical work in a car wheel factory, that "chilled cast iron car wheels rarely cracked in ordinary service after having been used for any considerable time; if wheels did not crack when comparatively new, they usually lasted until worn out or condemned for other causes." Although this curious fact was noticed, its real explanation was not discovered at the time, the cracking of new wheels being attributed to imperfect annealing in the oven.

In 1894 Mr. Outerbridge had occasion to test some cast iron bars for the Sellers Company. Before testing they were placed in a tumbling barrel to be cleaned, and when they came to be broken in the transverse testing machine Mr. Outerbridge "noticed with surprise that the average strength of the entire series was considerably higher than was usual with similar iron mixtures." A careful inquiry was made to ascertain the cause of the difference; but it was found that the machine was in good order and that the metal was of normal composition. The next step in the investigation was to cast twelve bars from one pattern and one runner. Six of these were cleaned by the tumbler and six with a wire brush. Upon breaking the twelve bars in the machine, it was found that those which had been subjected to four hours' incessant concussion in the tumbler were ten to fifteen per cent stronger than the other bars! Various explanations were offered and proved by experiment to be false, until Mr. Outerbridge suggested that the increase of strength might be due to the "mobility of molecules of cast iron at ordinary temperature when subjected to repeated shocks." This theory was tested by subjecting each of six new cast iron bars to 3,000 taps with a hammer upon one end. When they were broken in the machine they showed the same increase of strength as the bars that had been cleaned in the tumbler. He reasonably concluded that he had proved his case, and the engineering world is certainly indebted to him for the discovery of a most remarkable property of cast iron.

The details of Mr. Outerbridge's experiments were given in a paper which he read before the Pittsburg meeting of the American Institute of Mining Engineers. He claims that while it is very well known that the annealing of castings increases their strength by releasing the strains set up in cooling, it is not known that "the molecules of cast iron are capable of movement (for they do not touch each other) without the necessity of heating the castings, and they can thus rearrange themselves in comfortable relation to their neighbors and relieve the overcrowding near the surface of the casting; or, in more technical words, a molecular annealing may be accomplished at ordinary temperatures which will release the strains in the castings, precisely as does annealing by slow cooling in heated pits or ovens."

In addition to the transverse tests already enumerated, a series of impact experiments by means of a falling weight were carried out.

"Six of the 1 inch square test bars, cleaned with the wire brush, were broken upon the impact machine by dropping the weight from a sufficient height to break each bar at the first blow; the six companion bars, also cleaned with the brush, were then in turn sub-